

## Ian C. Duguid, Ph.D.

### AFFILIATION

Centre for Integrative Physiology, University of Edinburgh,  
School of Biomedical Sciences, Edinburgh, UK, EH8 9XD.  
Tel. + 44 131 650 3113  
Ian.Duguid@ed.ac.uk

### RESEARCH INTERESTS

Our research vision is to understanding the principle mechanisms underpinning cortical motor control. By combining *in vivo* electrophysiology, 2-photon calcium imaging, viral-based circuit mapping and quantitative behaviour, we aim to elucidate the cellular and circuit representations of movement in awake behaving rodents.

### PROFESSIONAL EXPERIENCE

Wellcome Trust Senior Research Fellow in Basic Biomedical Science Centre for Integrative Physiology, University of Edinburgh, UK.	Feb. 2016 – present
Senior Research Fellow (ESAT) Centre for Integrative Physiology, University of Edinburgh, UK.	Jan 2015 – Jan 2016
Wellcome Trust Research Career Development Fellow in Basic Biomedical Science Centre for Integrative Physiology, University of Edinburgh, UK.	Aug. 2009 – Dec 2014
Wellcome Trust Advanced Training Fellow in Basic Biomedical Science, Laboratory of Prof. Michael Häusser, University College London, UK.	Nov. 2006 – July 2009
MRC postdoctoral fellow Laboratory of Prof. Trevor Smart, University College London, UK.	Sept. 2001 – Nov. 2006

### EDUCATION

Ph.D in Neuroscience (July 2001), Pharmacology Department, London School of Pharmacy.  
BSc. Hons. in Pharmacology (July 1997), University of Aberdeen.

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### RESEARCH GRANTS

#### Principal Investigator

Project title: "Neural representations of movement in primary motor cortex".  
Funding scheme: Wellcome Trust Senior Research Fellowship (£1,705,322) - Duration: 02/16 - 01/21

#### Principal Investigator

Project title: "Thalamic control of motor cortical activity in awake behaving mice"  
Funding Scheme: University of Edinburgh (£35,000) - Duration: 01/15 - 01/16

#### Co-applicant (principal investigator: Dr. Matt Nolan)

Project title: "Cell type specific dissection of HCNI channel contribution to cerebellar output and motor behavior".  
Funding scheme: Wellcome Trust project grant (£363, 261) - Duration: 01/2011 – 12/2014

#### Principal Investigator (co-applicant: Prof. Megan Holmes)

Project title: "Functional magnetic resonance imaging in conscious mice".  
Funding scheme: Royal Society Research Grants (£14,471) - Duration: 03/11 – 03/12

#### Principal Investigator

Project title: "The role of presynaptic NMDA receptors in sensory information processing and cerebellar synaptic plasticity *in vivo*".  
Funding scheme: Wellcome Trust Research Career Development Fellowship (£889,307) - Duration: 08/09 – 07/14

#### Principal Investigator

Project title: "Integration and plasticity of sensory-evoked synaptic input in single cerebellar interneurons"  
Funding scheme: Wellcome Trust Advanced Training Fellowship (£245,105) - Duration: 04/06 – 03/09

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### PUBLICATIONS

#### Under review:

Jelitai M, Puggioni P, Ishikawa T, Rinaldi A and **Duguid IC\*** (2015). Dendritic excitation-inhibition balance shapes cerebellar output during motor behaviour. *Nature communications* (under revision). \***Corresponding author**.

#### Published:

Schiemann J, Puggioni P, Dacre J, Pelko M, Domanski A, van Rossum CW and **Duguid IC\*** (2015). Cellular mechanisms underlying behavioral state-dependent bidirectional modulation of motor cortex output. *Cell Reports* 11, 1319-1330 [PMC4451462]. \***Corresponding author**.

- Duguid IC\***, Branco T, Chadderton P, Arlt C, Powell K and Häusser M\* (2015). Control of cerebellar granule cell output by sensory-evoked Golgi cell inhibition. *PNAS* 112(42), 13099-13104 [PMC4620892]. **\*Co-corresponding author.**
- Powell K, Mathy A, **Duguid IC\*** and Häusser M\* (2015). Synaptic representation of locomotion in single cerebellar granule cells. *eLife* 10.7554/eLife. 07290 [PMC4499793]. **\*Co-corresponding author.**
- He Q, **Duguid IC**, Clark B, Panzanelli P, Patel B, Thomas P, Fritschy JM and Smart TG (2015). Interneuron- and GABAA receptor-specific inhibitory synaptic plasticity in cerebellar Purkinje cells. *Nature Communications*. 6, 7364 DOI: ncomms8364.
- Dodson D, Larvin JT, Duffell JM, Garas FN, Doig NM, Kessaris N, **Duguid IC**, Bogacz R, Butt SJB and Magill P (2015). Distinct Developmental Origins Manifest in the Specialized Encoding of Movement by Adult Neurons of the External Globus Pallidus. *Neuron* 86, 1-13.
- Harris AP, Lennen R, Marshall I, Jansen MA, Pernet CR, Brydges NM, **Duguid IC** and Holmes MC (2015). Imaging learned fear circuitry in awake mice using fMRI. *European Journal of Neuroscience* 5, 1-10, DOI: 10.1111/ejn.12939.
- Duguid IC\*** (2013). Presynaptic NMDA receptors: Are they dendritic receptors in disguise? *Brain Research Bulletin* 93, 4-9. **\*Corresponding author.**
- Duguid IC\***, Branco T, London M, Chadderton P, and Häusser M (2012). Tonic inhibition enhances sensory information transmission in the cerebellar cortex. *Journal of Neuroscience* 32(32), 11132-11143. **\*Co-corresponding author.**
- Duguid IC\*** and Smart TG. Presynaptic NMDA receptors (2009). *Biology of the NMDA receptor*. CRC Press: Chapter 14. **\*Co-corresponding author.**
- Mathy A, Ho SS, Davie JT, **Duguid IC**, Clark BA, Häusser M (2009). Encoding of oscillations by axonal bursts in inferior olive neurons. *Neuron* 62 (3): 388-399. [PMC277250].
- Rancz EA\*, Ishikawa T\*, **Duguid IC\***, Chadderton P\*, Mahon S and Häusser M (2007). High-fidelity transmission of sensory information by single cerebellar mossy fibre boutons. *Nature* 450 (7173):1245-8. **\*Co-first author.**
- Duguid IC**, Pankratov Y, Moss GW and Smart TG (2007). Somatodendritic release of glutamate regulates synaptic inhibition in cerebellar Purkinje cells via autocrine mGluR1 activation. *Journal of Neuroscience* 27(46), 12464-12474.
- Duguid IC** and Sjostrom PJ (2006). Novel presynaptic mechanisms for coincidence detection in synaptic plasticity. *Current Opinion in Neurobiology* 16(3), 312-22.
- Harvey VL, **Duguid IC**, Krasel C and Stephens GJ (2006). Evidence that GABA rho subunits contribute to functional ionotropic GABA receptors in mouse cerebellar Purkinje cells. *Journal of Physiology* 15;577(Pt 1), 127-39.
- Rees MI, Harvey K, Pearce BR, Chung SK, **Duguid IC**, Thomas P, Beatty S, Graham GE, Armstrong L, Shiang R, Abbott KJ, Zuberi SM, Stephenson JB, Owen MJ, Tijssen MA, van den Maagdenberg AM, Smart TG, Supplisson S, Harvey RJ (2006). Mutations in the gene encoding GlyT2 (SLC6A5) define a presynaptic component of human startle disease. *Nature Genetics* 38(7), 801-6.
- Duguid IC** and Smart TG (2004). Retrograde activation of presynaptic NMDA receptors enhances GABA release at cerebellar interneurone-Purkinje cell synapses. *Nature Neuroscience* 7(5), 525-533.
- Harvey K, **Duguid IC**, Alldred M, Beatty SE, Ward H, Keep NH, Lingenfelter SE, Pearce BR, Lundgren J, Owen MJ, Smart TG, Lüscher B, Rees MI and Harvey RJ (2004). The GDP-GTP exchange factor collybistin: an essential determinant of neuronal gephyrin clustering. *Journal of Neuroscience* 24(25), 5816-5826.
- Duguid IC** and Smart TG (2003). Regulation of cerebellar inhibitory synaptic plasticity by presynaptic NMDA receptors. *Journal of Physiology*. 547P PC29.
- Rees MI, Harvey K, Ward H, Evans L, **Duguid IC**, Hsu CC, Coleman SL, Miller J, Baer K, Waldvogel HJ, Gibbon F, Smart TG, Owen MJ, Harvey RJ and Snell RG (2003). Isoform heterogeneity of the human gephyrin gene (GPHN), binding domains to the glycine receptor, and mutation analysis in Hyperekplexia. *Journal of Biological Chemistry*, 278 (27), 24688-24696.
- Dunne EL, Hosie AM, Woollorton JRA, **Duguid IC**, Harvey K, Moss SJ, Harvey RJ and Smart TG (2002). An N-terminal histidine regulate Zn<sup>2+</sup> inhibition on the murine GABA receptor  $\beta$ 3 subunit. *British Journal of Pharmacology*, 137, 29-38.